REMARKS

Reconsideration of the above-identified application in view of the present amendment is respectfully requested.

By the present amendment claims 33-44 have been added to the application. Claim 33 includes the limitations of claims 1. Claim 33 also includes the limitation that the ignition material is a "mixture" of a metal powder and a particulate oxidizer. Claim 33 further includes limitations from claims 4 and 5. The limitations included from claim 4 are that "the oxidizer has an average particle size of about 1 μm to about 30 μm", and the limitations included from claim 5 are that "the metal powder is selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder".

The additional limitations recited in claim 33 are supported on: page 15, lines 15-20, which state,

> "Preferred metal powders formed by electro-explosion are electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder.";

page 14, lines 2-3, which state,

> "Preferably, the oxidizer incorporated in the ignition material has an average particle size of about 1 μm to about 30 μm."; and

page 8, lines 4-6, which state,

> "The ignition material 48 is a pyrotechnic composition that deflagrates when the bridgewire 44 is heated to a temperature of at least about 250°C."

Thus, claim 33 contains subject matter, which is described in the specification in such a way to reasonably convey to one skilled in the relevant art the applicants had possession of the invention.

With regard to the limitations that "the metal powder includes macro-agglomerates of metal particles and that the metal particles having an average diameter less than about 0.1 μm", which is indicated in item 2 of the May 23, 2001 Office Action as not being adequately disclosed, the applicants argue that these limitations are adequately described such as to convey to one of ordinary skill in the art what the intended coverage of the claim is. These limitations are supported at page 9, lines 9-18, which state that the electro-exploded metal particles agglomerate into macro-agglomerates that have a consistency of a powder with an average diameter of about 1 μm to about 2 μm.

Moreover, the language used in claim 33 is neither improper nor misdescriptive. The applicants found (and which is described in the specification) that an electro-exploded metal forms metal particles that have an average particle size less than about 100 nm and that these metal particles agglomerate to form macro-agglomerates that have an average diameter of about 1 μm to about 2 μm. It is unknown why these nanoparticles agglomerate, but it was observed that they do. Thus, this language is neither misdescriptive nor improper.

Therefor, claim 33 contains subject matter that was described in the invention in such a way as to convey to one

of ordinary skill in the art what the intended coverage is. Hence, claim 1 is definite.

Claims 34-40 include limitations similar to the limitations recited in original claims 2, 3, 6-10, respectively. Claim 41 includes limitations similar to the limitations recited in claim 25. Claim 42 includes limitations similar to the limitations recited in claim 33 as well as limitations similar to claim 28. Claims 43 and 44 includes limitations similar to the limitations recited in claim 26 and 29, respectively.

With respect to item 5 in the May 23, 2001 Office Action, the applicants request that the restriction requirement be withdrawn and that claims 11-19 and 21-32 be examined, because claims 11-19 and 21-32 would be obvious in view of the non-elected claims.

Claims 1-10 and 20 were rejected under 35 U.S.C. 103(a) as being unpatentable over Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom.

As noted in the Office Action claims 1-10 and 20 were cancelled. Claim 33 includes limitations similar to the limitations recited in claim 1 and claims 4 and 5. Claim 33 is patentable over Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom because: (1) Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder which is selected from the group consisting of

electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder, and an oxidizer which has an average particle size of about 1 μm to about 30 μm; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al.

Baginski, as noted in the Office Action, teaches the basic invention of explosive primers with a pyrotechnic mix around a bridgewire. The pyrotechnic compound can include zirconium and potassium perchlorate, or alternatively other pyrotechnic compounds, such as titanium hydride potassium perchlorate and boron potassium nitrate.

Baginski does not teach an ignition material that includes a metal powder selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder. Baginski also does not teach using an oxidizer that has an average particle size of about 1 μm to about 30 μm.

Halcomb et al. teach a thermite composition that uses a finely divide aluminum powder and a metal oxide such as iron oxide, copper oxide, tungsten oxide, or chromium oxide.

Halcomb et al. do not teach an ignition material that includes a metal powder selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc

powder, and electro-exploded yttrium powder. Halcomb et al. also do not teach using an oxidizer that has an average particle size of about 1 μm to about 30 μm.

Dixon et al. teach a lead free combustion primer that includes a metastable interstitial composite. The metastable interstitial composite includes aluminum and molybdenum trioxide having a particle size of about 0.1 μm or less.

Dixon et al. do not teach a metal powder selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder. Dixon et al. only disclose that the aluminum particles have a particle size of less than 0.1 μm not that they are formed by electro-explosion. As noted above and in the specification, electro-exploded metals form nano-sized particles that agglomerate into micron-sized powders. Dixon et al. neither disclose nor suggest that the aluminum particles in Dixon et al. have this feature. Dixon et al. only discloses that the particles form metastable interstitial composites.

Moreover, Dixon et al. state that the particle size of the oxidizer (i.e., MoO_3) is preferably less than 0.1 μm. Whereas, in the invention recited in claim 1, the oxidizer has a particle size of about 1 μm to about 30 μm.

Wheatley teaches a gas generating composition that includes an ammonium nitrate or a strontium nitrate based oxidizer mixture. (Column 2, lines 21-23). The gas

generating composition also includes exploded aluminum powder. The exploded aluminum powder is used as a combustion modifying additive to increase the burning rate and lower the pressure exponent of the ammonium nitrate or strontium nitrate gas generating composition. (Column 3, lines 31-35).

Wheatley does not teach that the oxidizer has an average particle size of about 1 µm to about 30 µm. Moreover, it would not have been obvious to use the electro-exploded powder taught in Wheatley in the ignition compositions taught in Baginski and Halcomb et al. Wheatley teaches using exploded aluminum as an additive to an ammonium nitrate based gas generating composition to lower the pressure exponent and increase the burning rate of the ammonium nitrate gas generating composition. The ignition compositions taught in Baginski and Halcomb et al., however, do not include ammonium nitrate and would therefore not have a high pressure exponent and a low burning rate, which is caused by ammonium nitrate. Hence, there would be no reason to add electro-exploded aluminum to the ignition compositions of Baginski and Halcomb et al.

The Office Action suggests that one using the electro-exploded aluminum in a similar pyrotechnic composition would expect similar results, and therefor its substitution would have been obvious. The pyrotechnic compositions taught in Baginski and Halcomb et al. are not similar pyrotechnic compositions to the gas generating composition taught in Wheatley. The pyrotechnic compositions taught in Baginski and Halcomb et al. are primary ignition composition that use a

metal as the primary fuel in combination with an oxidizer. The composition of Wheatley, in contrast, is a gas generating composition that includes an organic fuel, an oxidizer, and a metal additive. It is mere speculation, at best, whether the addition of a metal additive, which is used to increase the burning rate and lower the pressure exponent of a gas generating composition, would also increase the burning rate and lower the pressure exponent of an ignition composition. Further, there is nothing in the prior art that suggests that that the addition of electro-exploded aluminum to a pyrotechnic composition would even be desirable.

Lundstrom teaches a chlorate free auto-ignition composition that includes an azodiformamidine dinitrate, an oxidizer, and an accelerator. The accelerator used in conjunction with the azodiformamidine dinitrate preferably includes a fine iron oxide powder, which has an average particle size of about 3 nm.

Lundstrom does not teach an ignition material that includes a metal powder selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder. Lundstrom also does not teach using an oxidizer that has an average particle size of about 1 μm to about 30 μm.

Thus, claim 33 is not obvious over Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom. Therefore, allowance of claim 33 is respectfully requested.

Claim 34 depends from claim 33 and further recites that the macro-agglomerates have an average diameter of about 1 μm to about 2 μm.

As noted above with respect to claim 33, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is electro-exploded aluminum, and an oxidizer, which has an average particle size of about 1 μm to about 30 μm; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al. Therefore, claim 35 is allowable for the same reasons as claim 33 and for the specific limitations recited with respect to claim 35.

Claim 35 depends from claim 33 and further recites that the oxidizer is selected from the group consisting of alkali metal nitrates, alkaline earth metal nitrates, alkali metal perchlorates, alkaline earth metal perchlorates, alkali metal chlorates, alkaline earth metal chlorates, ammonium perchlorates, ammonium nitrate, and mixtures thereof.

As noted above with respect to claim 33, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is electro-exploded aluminum, and an

compositions of Baginski or Halcomb et al. Therefore, claim 38 is allowable for the same reasons as claim 33 and for the specific limitations recited with respect to claim 38.

Claim 39 depends from claim 33 and further recites that the ignition material upon deflagration produces an ignition product with a temperature of about 3000°C to about 6000°C.

As noted above with respect to claim 33, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder, and an oxidizer, which has an average particle size of about 1 μm to about 30 μm; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al.

Moreover, none of the references disclose or suggests an ignition material, which upon deflagration, produces an ignition product with a temperature of about 3000°C to about 6000°C. The only reference that discloses a temperature, is Wheatley. Wheatley, however, teaches that the combustion temperature is below 2300K.

Therefore, claim 39 is allowable for the same reasons as claim 33 and for the specific limitations recited with respect to claim 39.

Claim 40 depends from claim 33 and further recites that the ignition material does not thermally decompose at temperatures up to about 120°C.

As noted above with respect to claim 33, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder, and an oxidizer, which has an average particle size of about 1 μm to about 30 μm; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al. Therefore, claim 40 is allowable for the same reasons as claim 1 and for the specific limitations recited with respect to claim 40.

Claim 41 depends from claim 1 and further recites that the metal powder has a surface area of about 15 square meters per gram.

As noted above with respect to claim 41, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an

Claim 42 contains limitations, which are similar, to the limitations recited in claim 33. As noted above with respect to claim 33, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder, and an oxidizer, which has an average particle size of about 1 μm to about 30 μm; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al.

Moreover, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose that the metal powder comprises about 25% to about 50% by weight of the ignition material and the oxidizer comprises about 50% to about 75% by weight of the ignition material.

Baginski and Halcomb et al. do not teach the percentages of the metal fuel and the oxidizer in each of their respective ignition compositions. Dixon et al. teach aluminum at a percentage of 45% and MoO_3 at a percentage of 55%; however, Dixon et al. do not teach that the aluminum is electro-exploded or that the MoO_3 has a particle size of about 1 μm to about 30 μm. Wheatley teach adding electro-exploded aluminum

to a gas generating composition, but only in a weight percentage of up to 20% by weight of the gas generating material. Likewise, Lundstrom teach adding super fine iron oxide to a gas generating composition, but only in an amount of up to about 10%.

Therefore, claim 42 is patentable over the Baginski in view of Halcomb et al. Dixon et al., Wheatley, and Lundstrom and allowance of claim 42 is respectfully requested.

Claim 43 depends from claim 42 and further recites that the oxidizer is selected from the group consisting of alkali metal nitrates, alkaline earth metal nitrates, alkali metal perchlorate, alkaline earth metal perchlorates, alkali metal chlorates, alkaline earth metal chlorates, ammonium perchlorate, ammonium nitrate, and mixtures thereof.

As noted above with respect to claim 42, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder, and an oxidizer, which has an average particle size of about 1 μm to about 30 μm; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al. Therefore, claim

43 is allowable for the same reasons as claim 42 and for the specific limitations recited in claim 43.

Claim 44 depends from claim 42 and further recites that the ignition material upon deflagration produces an ignition product with a temperature of about 3000°C to about 6000°C.

As noted above with respect to claim 42, Baginski in view of Halcomb et al., Dixon et al., Wheatley, and Lundstrom do not disclose or suggest an ignition material for an electrically actuatable igniter that deflagrates when heated to a temperature of at least about 250°C and that includes a metal powder, which is selected from the group consisting of electro-exploded aluminum powder, electro-exploded titanium powder, electro-exploded copper powder, electro-exploded zinc powder, and electro-exploded yttrium powder, and an oxidizer, which has an average particle size of about 1 μm to about 30 μm; and (2) it would not have been obvious to use the electro-exploded particles taught in Wheatley in the ignition compositions of Baginski or Halcomb et al. Therefore, claim 44 is allowable for the same reasons as claim 42 and for the specific limitations recited in claim 44.

In view of the foregoing, it is respectfully submitted that the above-identified application is in condition for allowance, and allowance of the above-identified application is respectfully requested.

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Please charge any deficiency or credit any overpayment in the fees for this amendment to Deposit Account No. 20-0090.

Respectfully submitted,

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